ONTARIO MINISTRY OF ENVIRONMENT
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ANNUAL REPORT 1965

Brampton-Chinguacousy

water pollution control plant

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Brampton - Chinguacousy :
water pollution control plant.
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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Mayor and Members of Council,
Town of Brampton.

Reeve and Members of Council,
Township of Chinguacousy.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Brampton-Chinguacousy Water Pollution Control Plant, OWRC Project No. 58-S-14.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager.

Canada

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1965
NSFC

NSFC

ONTARIO WATER RESOURCES COMMISSION
801 BAY STREET
TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to provide you with the 1965 Annual Report on the operation of the Brampton-Chinguacousy Water Pollution Control Plant, OWRC Project No. 58-S-14.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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BRAMPTON - CHINGUACOUSY

water pollution control plant

operated for

THE TOWN OF BRAMPTON

and

THE TOWNSHIP OF CHINGUACOUSY

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M.P.P.

COMMISSIONERS

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D. A. Moodie — L. E. Venchiarutti

GENERAL MANAGER: D. S. Caverly

ASSISTANT GENERAL MANAGERS

L. E. Owers — K. H. Sharpe
F. A. Voege — A. K. Watt

COMMISSION SECRETARY

W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: A. Clark

801 Bay Street Toronto 5

'65 REVIEW

The cost per million gallons treated rose to $66.27 This was an increase of 30% over 1964 but is still considerably below average. The increase was due to sludge hauling costs caused by construction, and to the institution of 16-hour supervision.

The following comments should be made on the detailed operating costs listed on page 12:

1. Payroll: The high payroll figure for October was due to the fact that the month included three pay days.

2. Repairs and Maintenance: The September credit arose because the cost was charged against Bramalea for pump repair.

3. Water: The meter chamber was flooded in the spring, and therefore readings were not taken until May.

The total plant flow in 1965 was 840.14 mg, an increase of 29.681 mg over 1964. The average daily flow for the year was 2.3 mg. The rate of flow during daylight hours was in excess of 3.0 mgd.

The raw sewage had an average 5-day BOD of 390 ppm and a suspended solids concentration of 715 ppm. The final effluent had an average 5-day BOD of 42 ppm and a suspended solids concentration of 39 ppm. This indicates a removal efficiency of 89 and 94.5% respectively.

The BOD of the raw sewage was considerably higher than normal, as was the suspended solids content. This was due to the high quantity of industrial wastes present in the raw sewage.

Regular inspections were carried out by engineers and technicians from head office, while the Division of Research ran pilot studies on tertiary treatment by lagooning.

Work began on a 3 mgd extension to the plant in September, 1965.

An Industrial Waste survey of Brampton and Bramalae was conducted in 1965. Twenty-four individual industries were investigated and an assessment made of the effect of their wastes on the water pollution control plant.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1956 - 1965

INCEPTION

In 1956, the Town of Brampton commenced discussions with the Ontario Water Resources Commission for the construction of a water pollution control plant in the northern end of the Township of Toronto. Proctor and Redfern were the consulting engineers for the scheme.

APPROVAL

In 1958, the Town of Brampton entered into an agreement with the OWRC for the financing, construction and operation of the plant.

CONSTRUCTION

Andeen Construction Limited of Brampton received the contract for the construction of a 1 MGD water pollution control plant in August 1958 and work commenced soon afterwards.

In November, 1959, the OWRC signed an agreement with the Township of Chinguacousy entitling that Township to the use of 40% of plant capacity until an extension was built. In that event, Chinguacousy would be entitled to full use of 50% of the extended project.

The Commission commenced operation of the project in January , 1960.

Truline Construction Company Limited completed a 1 mgd extension in September, 1963.

Work began on a 3 mgd extension to the plant in September, 1965.

TOTAL COST

The total cost of the project was $1,451,536.

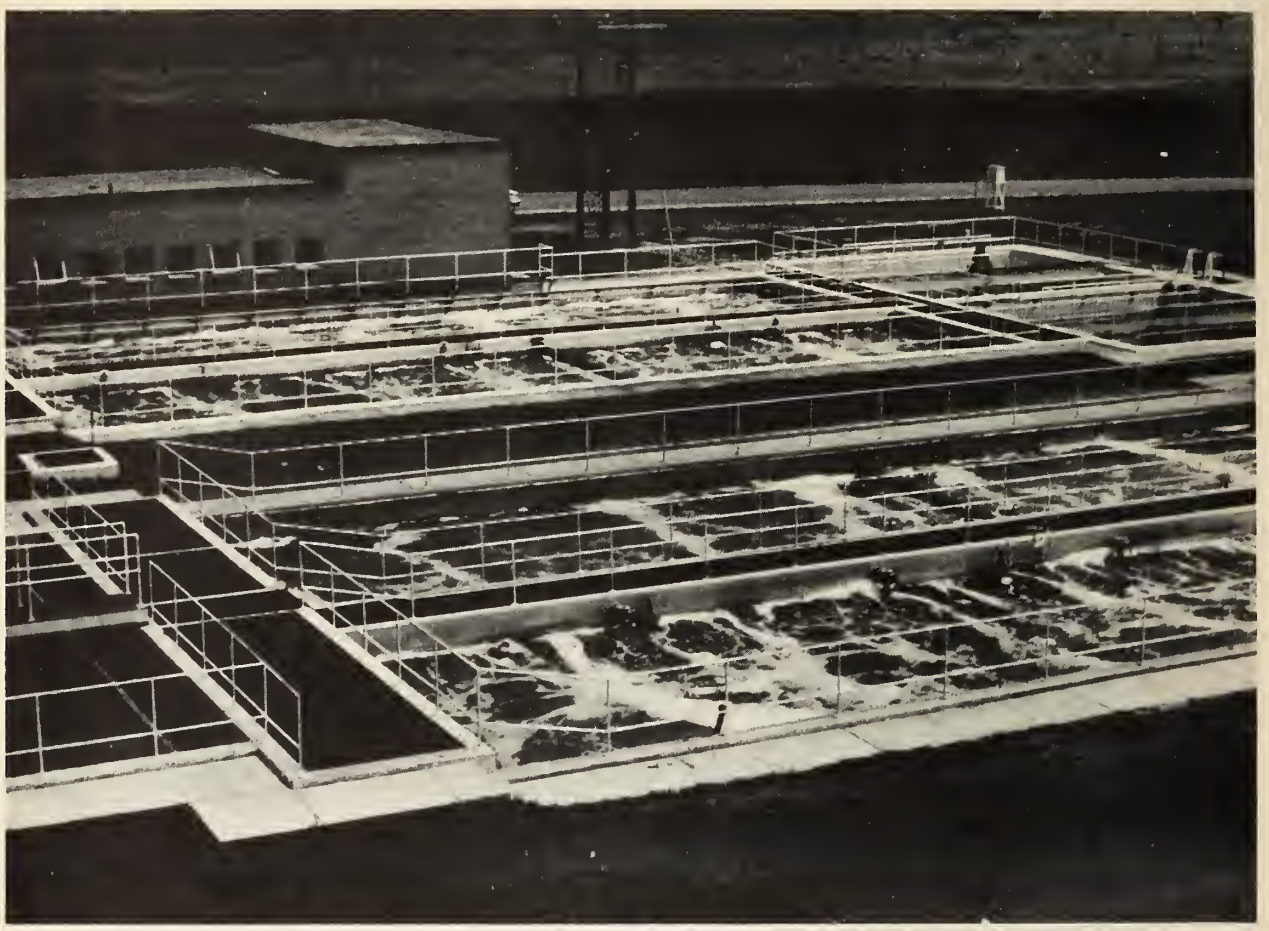


IRVINE GREGORY

Project Staff

Irvine Gregory joined the Commission on January 25, 1960, as an operator at the Brampton plant, and later became Chief Operator. A. P. Friesen and D. J. Bailie joined the Brampton staff as operators in April, 1960, and May, 1962, respectively.

In the past, use was made of casual help to supplement the work of the regular operators. However, due to the large volumes of strong sewage and the effects of certain industrial wastes, plus the need to obtain maximum efficiency from the plant, it became necessary to provide 16-hour supervision. In June, 1965, two new operators, J. Huisjes and C. Sizer, were appointed.



Description of Project

INFLUENT WORKS

The waste water enters the plant through two gravity sewers, 42 inch and 27 inch in diameter. There is also 10 inch force-main from Bramalea. It is then screened to remove large objects and passed through a barminutor which screens and shreds the larger particles to a size suitable for handling in the treatment plant. From this point, it flows to the primary sedimentation tanks.

PRIMARY SEDIMENTATION TANKS

The two primary sedimentation tanks are designed to provide an adequate detention period to allow the heavier solids to settle out, and for the removal of surface scum and grease. The heavier solids which settle out to the bottom of the tank and surface scum are collected by a scraper mechanism and withdrawn to a sludge pit from where they are pumped to the primary digester.

The primary sedimentation tanks are designed to provide sufficient detention to allow removal of 30-35% of the heavy organic material.

The settled waste water flows over the effluent weirs and discharges to the aeration tanks.

AERATION

Settled sewage flows from the primary.

sedimentation tanks to the four aeration sections. There it is mixed with activated sludge which is returned from the final sedimentation tanks and aerated.

The aeration sections retain the sewage for 8 hours at a flow of 2.0 million gallons per day. Air is supplied by three blowers with a usable capacity of 1700 cubic feet of air per minute, and a standby capacity of 850 cubic feet per minute.

FINAL SEDIMENTATION

The aerated mixed liquor from the aeration sections is retained in four final sedimentation tanks for 2 3/4 hours at design flow. This allows the activated sludge to settle. It is collected from the bottoms of the tanks and returned to the aeration sections. (Excess activated sludge is returned to the primary sedimentation tanks and is pumped from there to the digesters). The remaining liquid flows over the weirs of the final sedimentation tanks to the chlorine contact chamber.

DIGESTION

Sludge digestion in this plant is performed in two stages, called primary and secondary digestion.



TRACTOR OUTSIDE INFLUENT WORKS



PRIMARY DIGESTER AND CONTROL BUILDING

The sludge from the primary tanks is pumped, with excess activated sludge to the primary digester. In the absence of air, and in a regulated temperature of 90°F., the decomposing or digestion process begins. Constant agitation within the tank ensures overall treatment.

The raw sludge is broken down by anaerobic bacterial action and, when thoroughly digested, is a thick, black, odourless liquid.

The secondary digester receives the digested material from the primary and completes the process. The secondary digester is not agitated but is allowed to be quiescent. The supernatant is decanted and returned to the treatment process.

Sludge gas, principally methane, formed during the process is used as a fuel for the heat exchanger and boiler supplying heat to the digester and buildings. Oil is used as standby fuel.

CHLORINATION

From the final sedimentation tank the effluent flows to a chlorine contact chamber where it is chlorinated to reduce the bacterial count to within acceptable limits. It is then discharged to the Etobicoke Creek.

PROJECT COSTS

(STAGES 1 and 2)

LONG TERM DEBT TO OWRC

Brampton	$ 871,385.58
Chinguacousy	106,588.55
Total Capital Cost	$ 977,974.13

Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965:

Brampton	$ 129,661.15
Chinguacousy	5,179.00
	$ 134,830.15

The total cost to the municipalities during 1965 was as follows:

NET OPERATING		
Brampton	$ 27,839.38	
Chinguacousy	36,680.63	
		$ 64,520.01
DEBT RETIREMENT		
Brampton	$ 17,706.00	
Chinguacousy	2,143.00	
		$ 19,849.00
RESERVE		
Brampton	$ 4,595.91	
Chinguacousy	3,412.15	
		$ 8,008.06
INTEREST CHARGES		
Brampton	$ 48,666.89	
Chinguacousy	9,366.61	
		$ 58,033.50
	TOTAL	$ 150,410.57

RESERVE ACCOUNT

Balance at January 1, 1965 (Revised)		
Brampton	$ 28,193.53	
Chinguacousy	11,787.90	
		$ 39,981.43
Deposited by Municipalities		
Brampton	$ 4,595.91	
Chinguacousy	3,412.15	
		$ 8,008.06
Interest Earned		
Brampton	$ 1,657.72	
Chinguacousy	728.75	
		$ 2,386.47
		$ 50,375.96
Less Expenditures		-
Balance at December 31, 1965		$ 50,375.96

TOTALS FOR EACH MUNICIPALITY

Total Cost:	Brampton	$ 98,808.18
	Chinguacousy	51,602.39
		$ 150,410.57
Reserve Account:	Brampton	$ 34,447.16
	Chinguacousy	15,928.80
		$ 50,375.96

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	*SUNDRY	WATER
JAN	2766.30	819.31	490.08		542.12	560.06	41.11	297.15		16.47	
FEB	3996.24	944.70	724.04		543.60		72.67	216.92	1168.24	84.79	241.28
MARCH	4413.87	1063.35	591.52		532.33	560.06	169.97	135.00	705.79	655.85	
APRIL	2730.34	1078.69	499.22		522.52	448.05	50.09		86.02	45.75	
MAY	5894.29	1386.84	714.68		514.51		72.90	270.00	32.50	2208.07	694.79
JUNE	5148.97	1300.47	591.35		509.45	448.05	107.65	362.14	460.15	1108.74	260.97
JULY	4644.28	1554.39	742.66		521.05	448.05	370.68	135.00		872.45	
AUG	5354.86	1632.06	539.32		467.45	448.05	129.07	422.81	165.96	1334.53	215.61
SEPT	3967.93	1411.25	424.98		527.87	448.05	226.42		(397.11)	1326.47	
OCT	5037.56	2652.00	341.64		507.67	448.05	149.01	1.85	344.68	363.42	229.24
NOV	4639.72	1413.74	283.76		521.33	448.05	46.48	82.35	(9.62)	1853.63	
DEC	7084.40	1358.51	283.76		584.28	896.10	181.02	37.87	1453.47	2037.99	251.40
TOTAL	** 55678.76	16615.31	6227.01		6294.18	5152.57	1617.07	1961.09	4010.08	11908.16	1893.29

* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $8067.40

BRACKETS INDICATE CREDIT

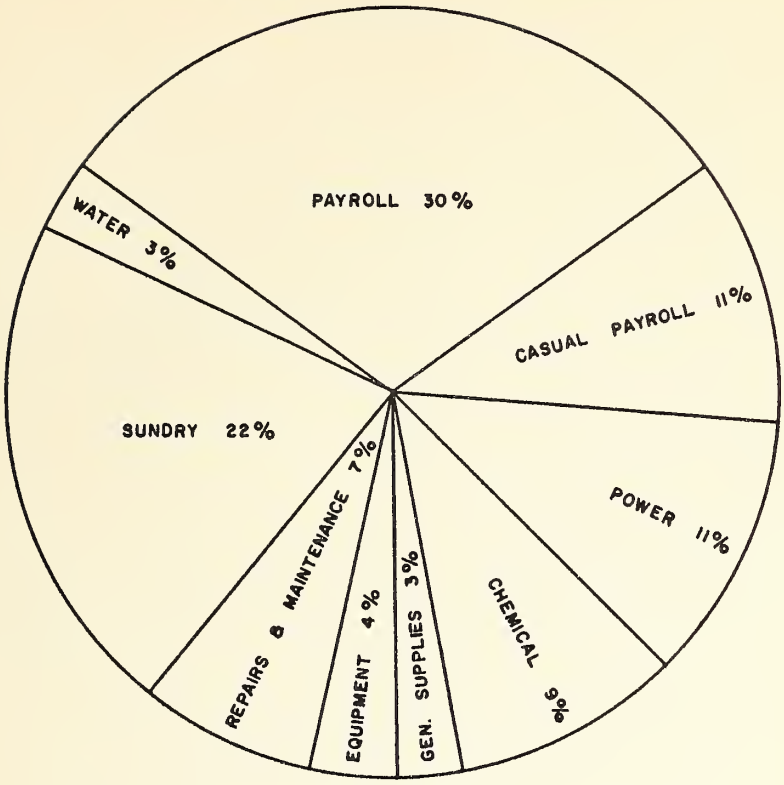
** DOES NOT INCLUDE COST OF OPERATING PUMPING STATION, WHICH WAS $8,841.25

YEARLY OPERATING COSTS

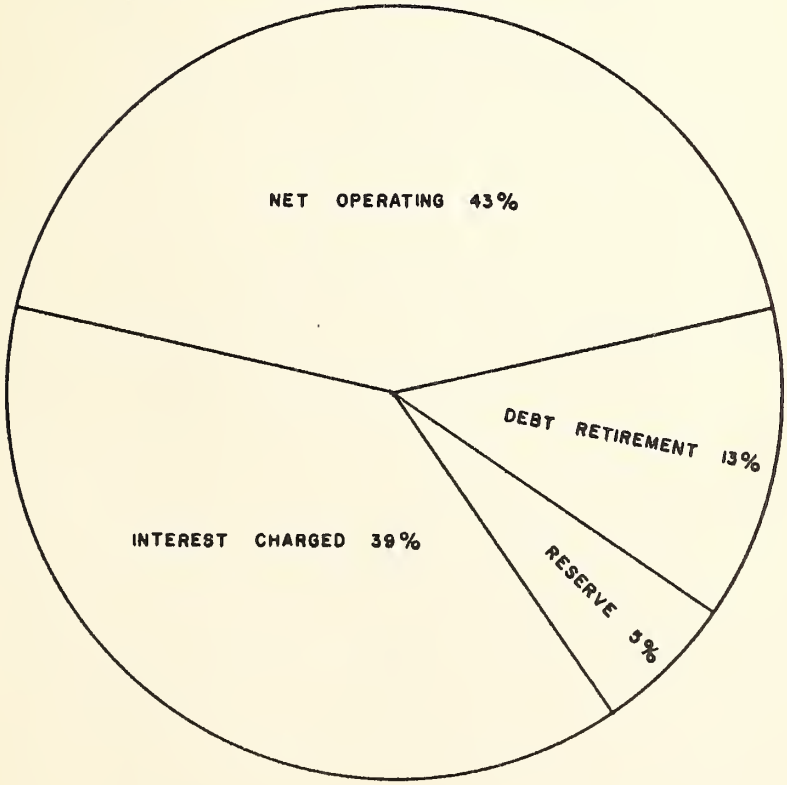
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1961	345.128	$ 25295.74	* $5.66	$73.30	3 CENTS
1962	441.847	27441.44	$5.78	$62.20	2 CENTS
1963	539.173	29054.11	$5.11	$53.90	1 CENT
1964	810.463	41489.00	$6.16	$51.19	1 CENT
1965	840.142	55678.76	$7.25	$66.27	2 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

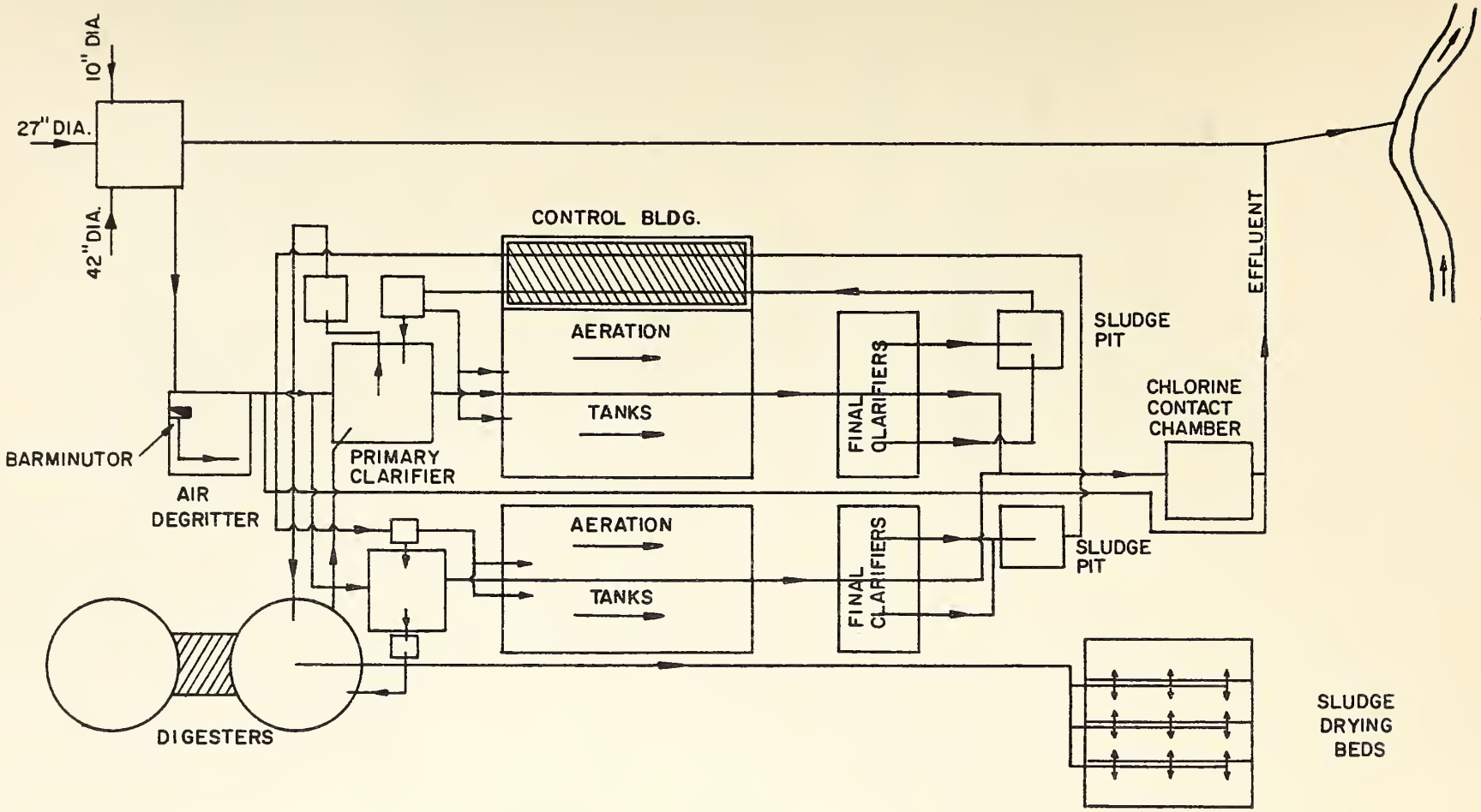
1965 OPERATING COSTS



TOTAL ANNUAL COSTS



Technical Section



FLOW DIAGRAM

Design-Data

GENERAL

Type of Plant - Activated sludge.

Design Population - 20,000 persons.

Design Plant Flow - 2 MGD.

Per Capita Flow - 100 gpd.

Five Day BOD -

Raw Sewage - 220 ppm

Removal - 90%

Suspended Solids -

Raw Sewage - 250 ppm

Removal - 95%

PRIMARY TREATMENT

COARSE SCREENING

Comminution

24" Model B Barminutor

Grit Removal

Air degrittor, five minute detention.

PRIMARY SEDIMENTATION

Two clarifiers - 42 ft. square by 10 ft. deep.

Detention Period - 2 hours 30 minutes.

Surface Settling Rate - 700 gallons per square foot of tank per day.

Overflow Rate - 6750 gallons per lineal foot of weir per day.

SECONDARY TREATMENT

Four aeration tanks.

Total capacity - 136,800 cubic feet.

Detention Period - 8 hours.

Return Sludge capacity - 75%

Air supply one cubic ft. per gallon

Three cyclo-blowers - 850 cfm capacity each

FINAL SEDIMENTATION

Four clarifiers - 32 ft. square x 10 ft. deep.

Detention Period - 2 hours 45 minutes.

Surface Settling Rate - 500 gallons per lineal foot of weir per day.

Weir Overflow Rate - 4720 gallons per lineal foot of weir per day.

CHLORINE CONTACT CHAMBER

30 ft. x 15 ft. x 7 ft. (L.W.D.)

Detention Period - 15 minutes.

Chlorinator Capacity - 100 lbs. per 24 hours.

DIGESTER

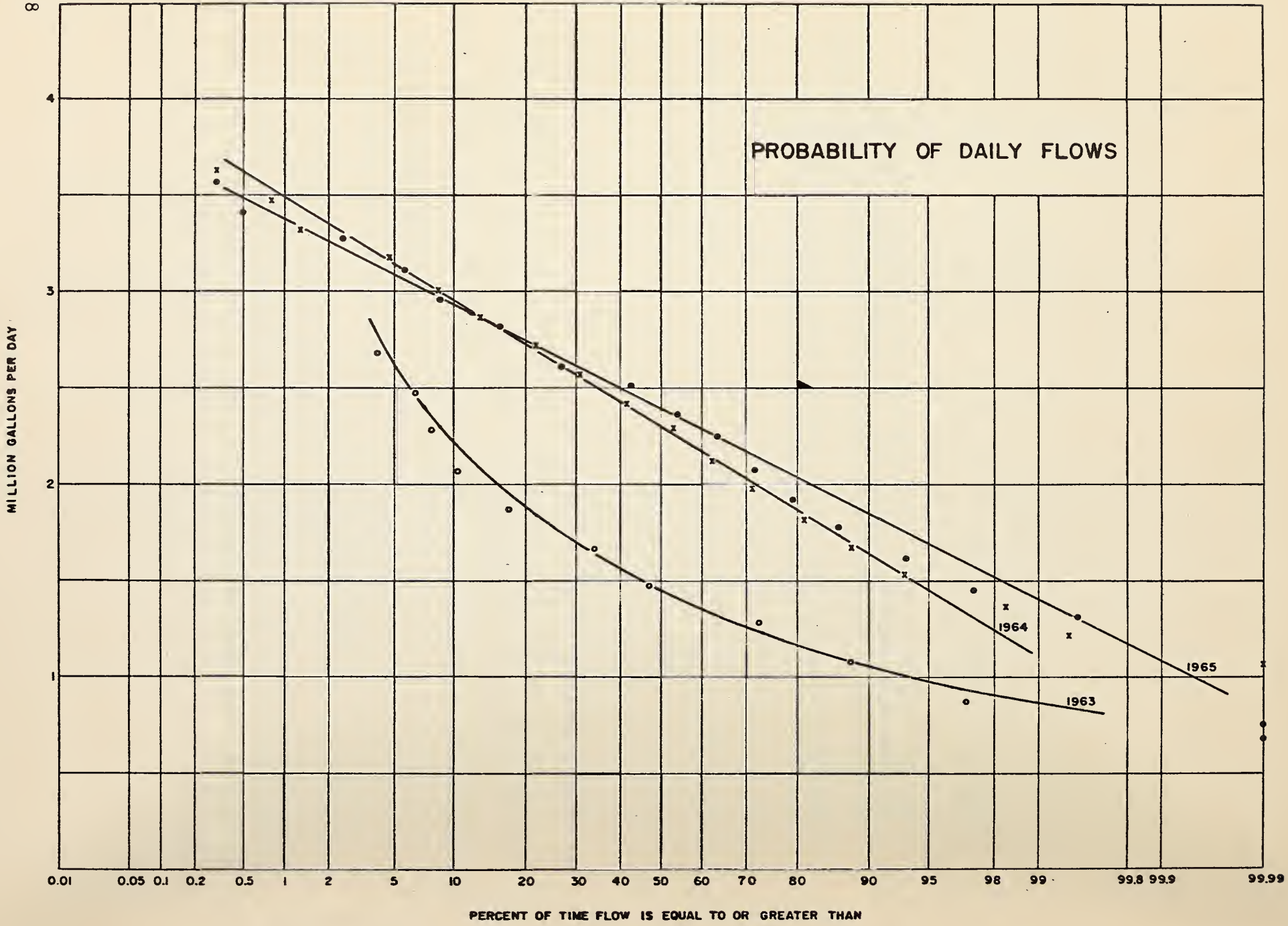
Two stage digestion
Two tanks - 50 ft. in diameter x 20 ft. deep
Capacity - 3.33 cubic feet per capita.
Loading - 2.25 lbs. solids per cubic foot of tank per month.

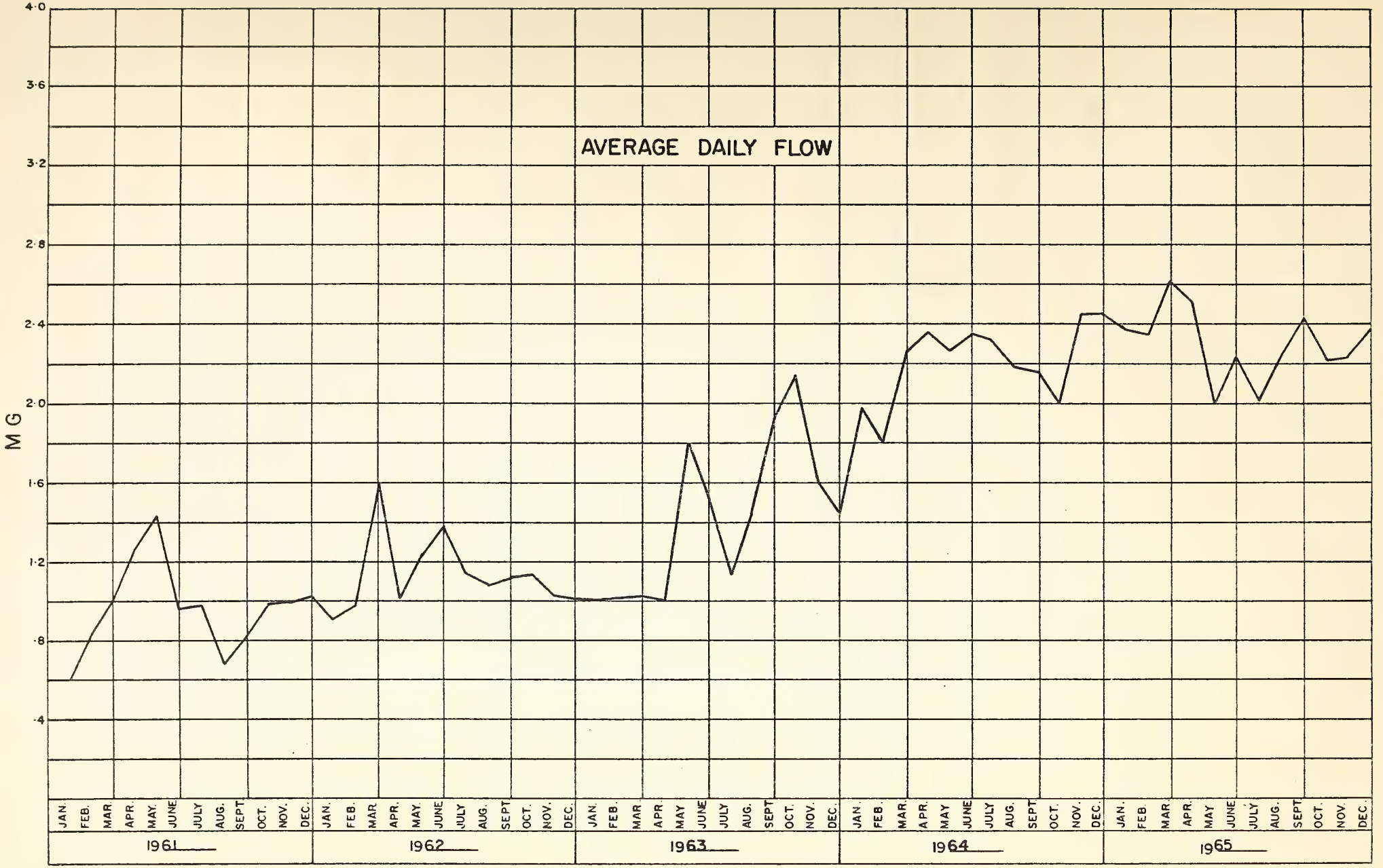
Sludge drying beds 1.87 sq. ft. per capita.

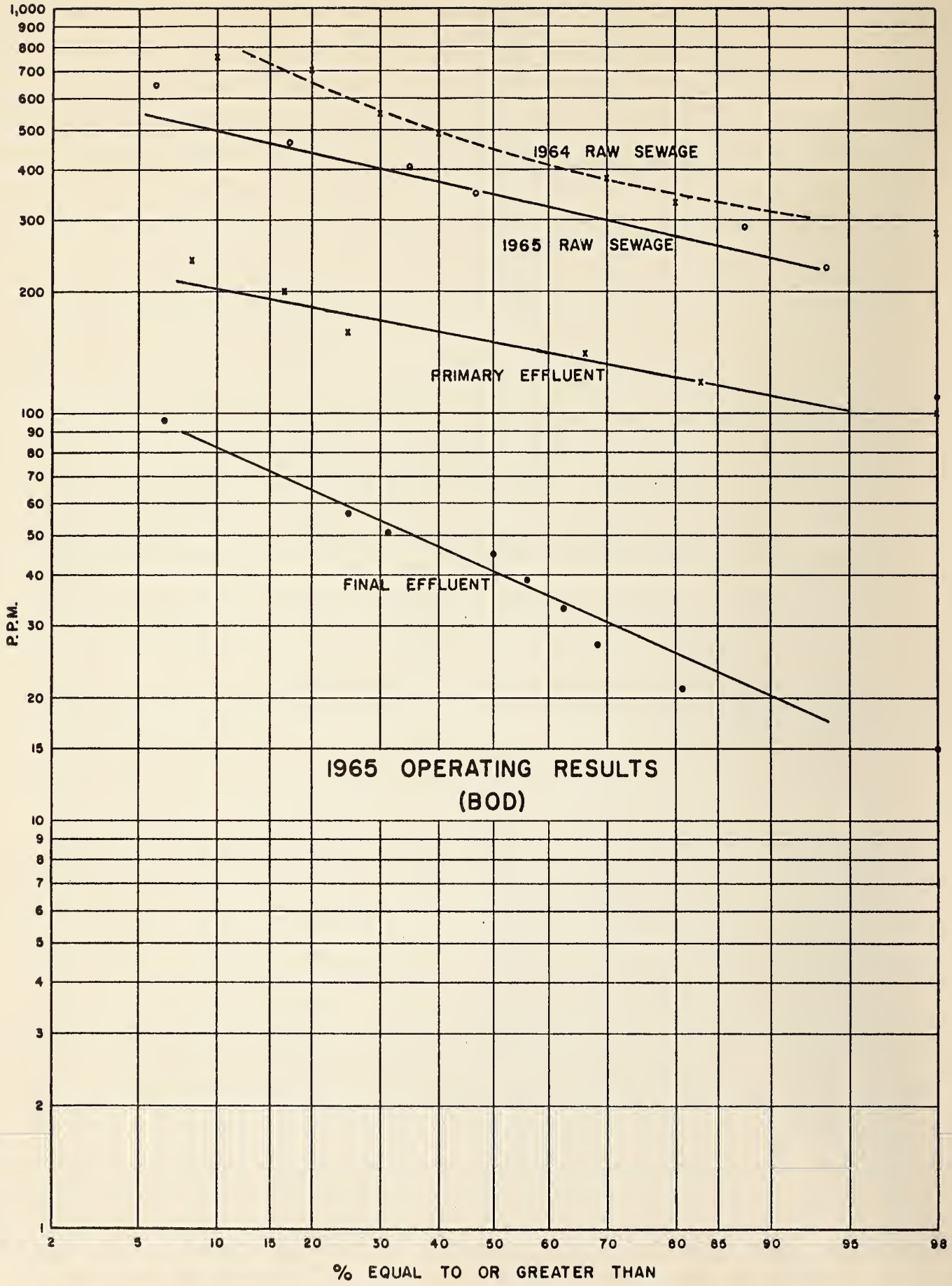
Process Data

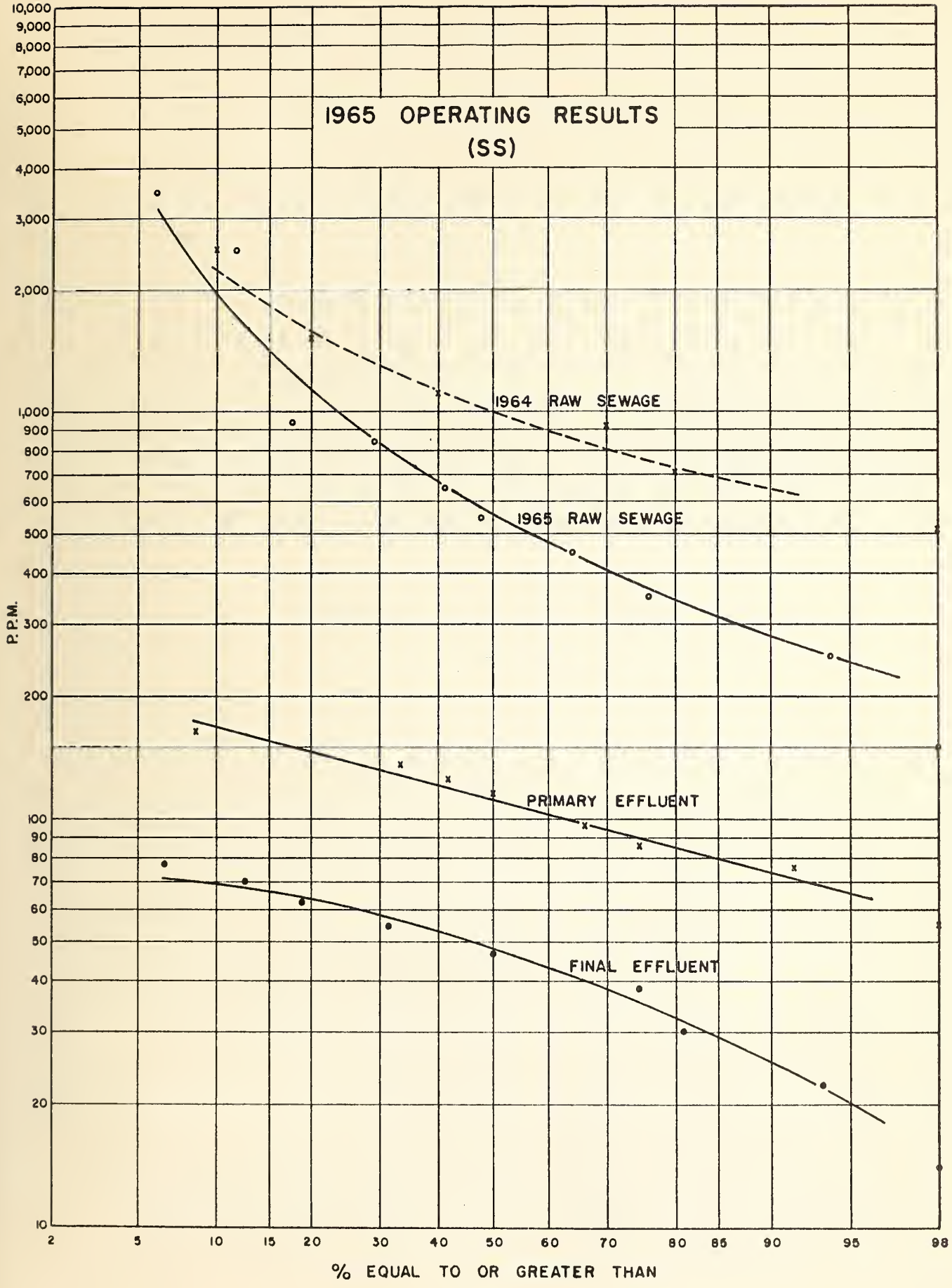
The maximum 24 hour flow recorded in 1965 was 3.513 mg, registered during the week ending January 16, 1965. The maximum monthly flow for the year occurred during the month of March when 81.10 mg were treated.

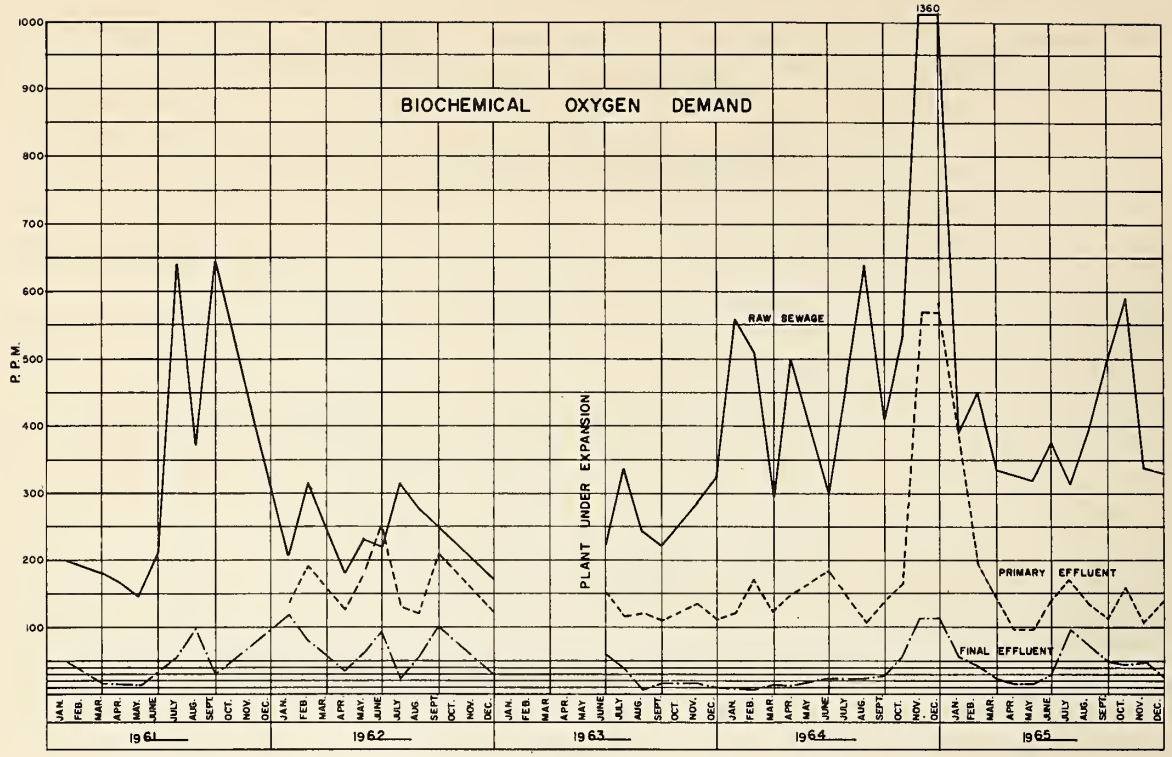
There was no sharp increase in flows over 1964 due to building restrictions in the area. However, the plant facilities were overloaded 80% of the time.


PROBABILITY OF DAILY FLOWS
MILLION GALLONS PER DAY
4
3
2
1
1964
1965
1963
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN

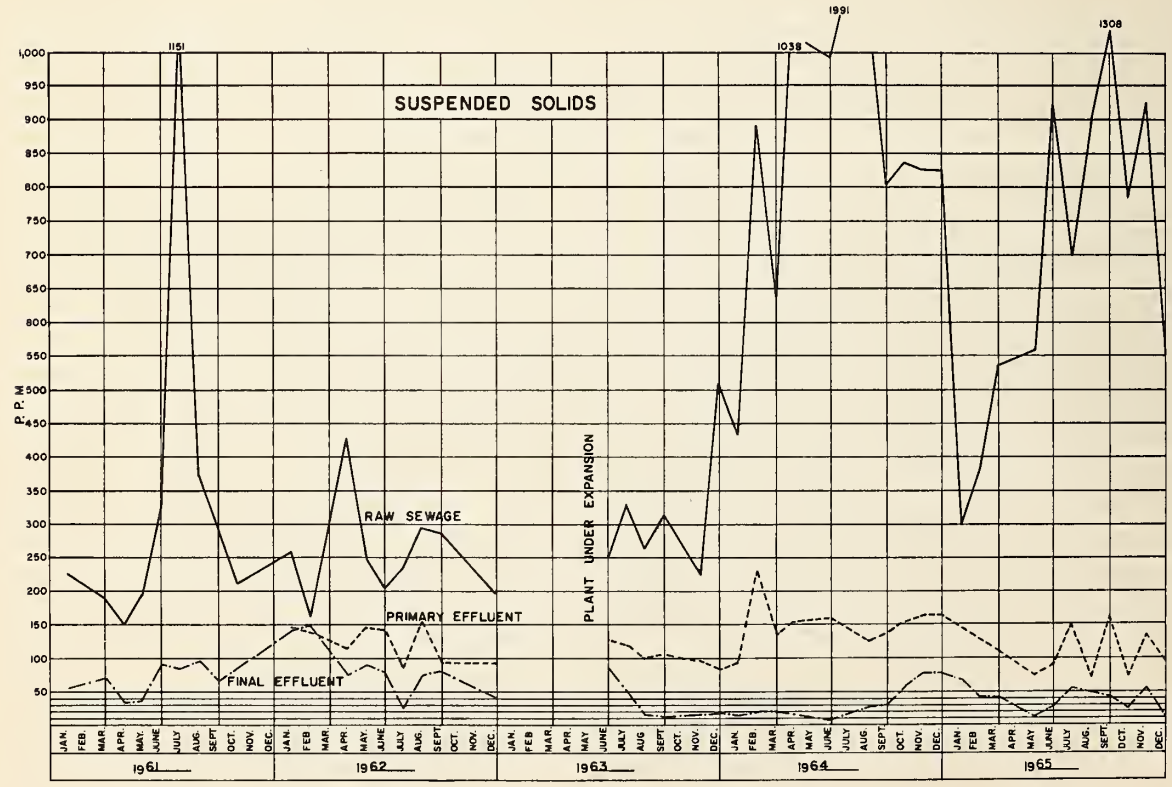

AVERAGE DAILY FLOW
M G
4·0
3·6
3·2
2·8
2·4
2·0
1·6
1·2
·8
·4
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1961
1962
1963
1964
1965


1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
P.P.M.
1964 RAW SEWAGE
1965 RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
1965 OPERATING RESULTS
(BOD)
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% EQUAL TO OR GREATER THAN


1965 OPERATING RESULTS
(SS)
1964 RAW SEWAGE
1965 RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
P.P.M.
% EQUAL TO OR GREATER THAN
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
10
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98



MONTHLY VARIATIONS



GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	390	53	86.5	124.1	301	72	76.0	84.4	513
FEB.	450	41	91.0	134.8	385	44	88.5	112.4	702
MAR.	336	24	93.0	125.6	536	42	92.0	200.3	540
APR.	* 390	42	89.0	131.7	*715	39	94.5	255.8	513
MAY	310	14	95.5	91.8	560	13	97.5	169.6	513
JUNE	375	28	92.5	116.6	921	29	97.0	299.8	540
JULY	315	97	69.0	70.9	700	56	92.0	209.3	567
AUG.	385	* 42	89.0	119.8	900	39*	95.5	300.7	540
SEPT.	500	50	90.0	163.6	1308	41	97.0	460.8	621
OCT.	590	43	92.5	188.5	788	27	96.5	262.3	567
NOV.	338	47	86.0	97.0	924	51	94.5	291.2	611
DEC.	300	23	92.5	98.2	544	14	97.5	189.0	621
TOTAL	-	-	-	1461.8	-	-	-	2839.7	6848
AVG.	390	42	89.0	121.8	715	39	94.5	236.6	571

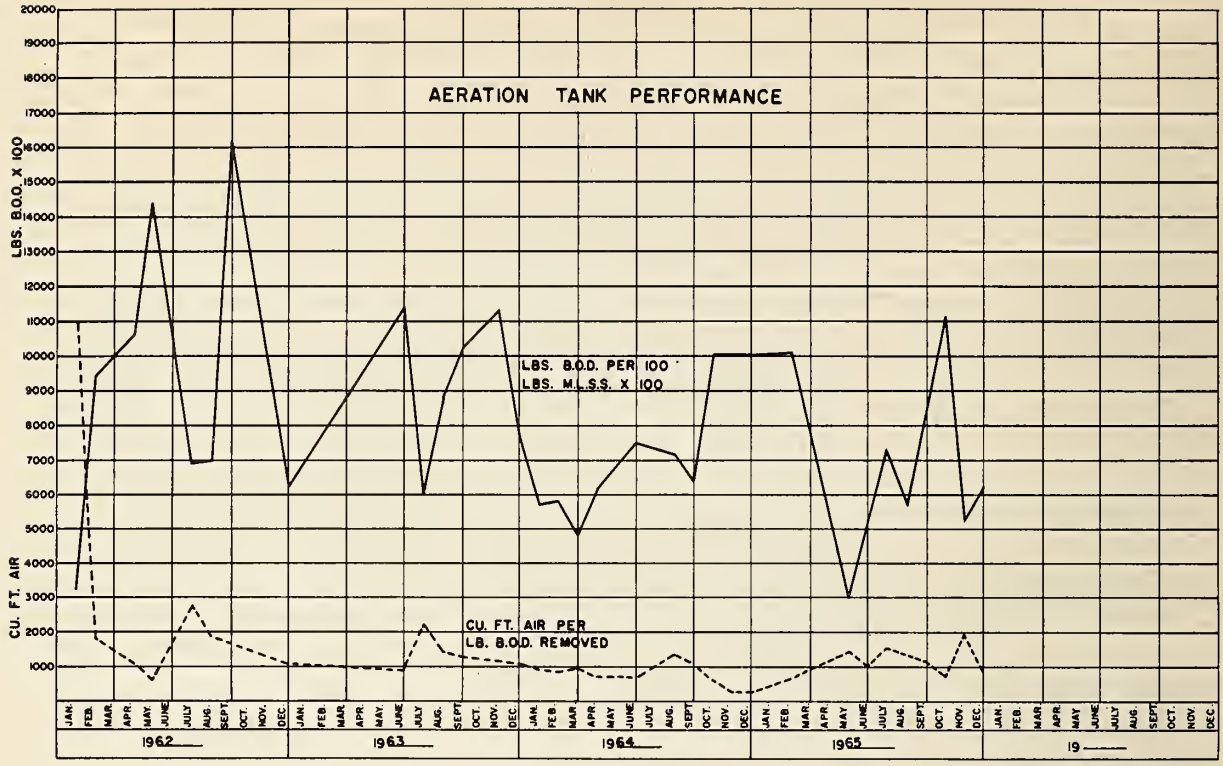
* average values substituted

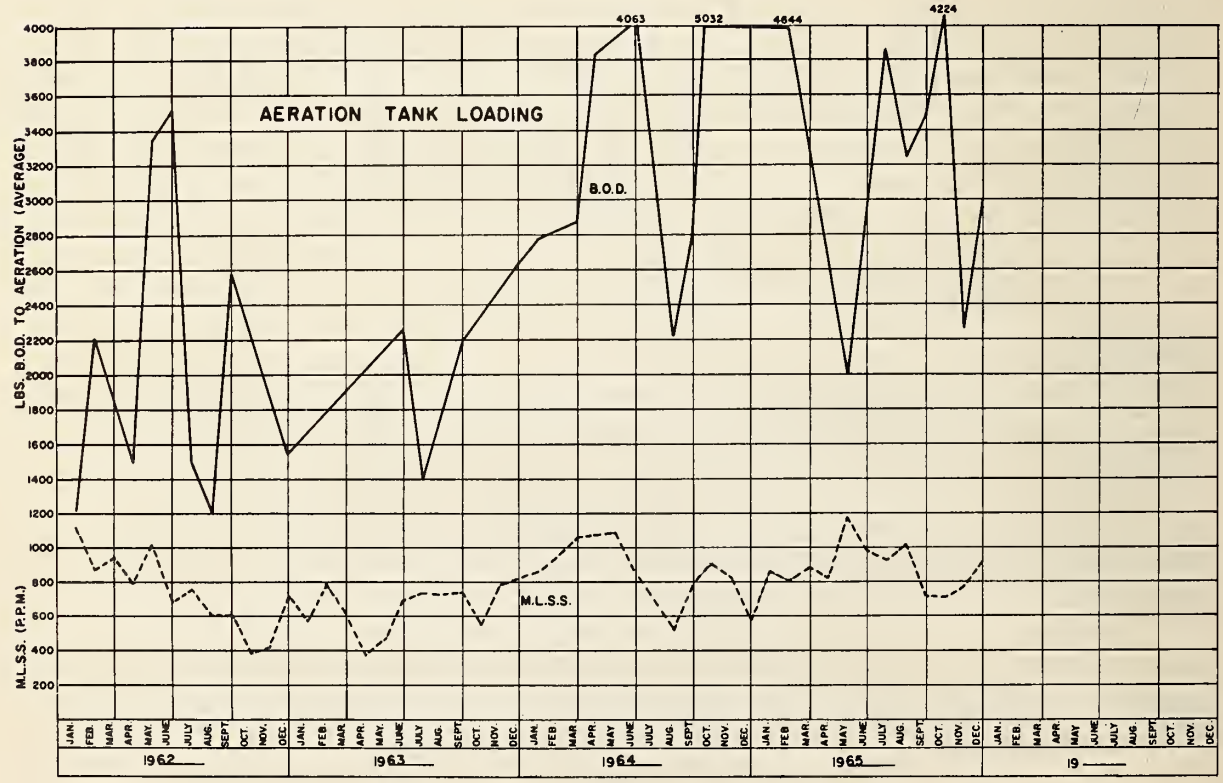
COMMENTS

An average loading of 309 ppm 5-day BOD and 715 ppm SS was experienced in 1965. The average BOD and SS in the final effluent was 42 and 39 respectively, both being in excess of the OWRC objectives of 15 ppm.

The present plant was designed to handle 4400 pounds of BOD and 5000 pounds of SS per day. The average daily loading during 1965 was 7100 pounds of BOD and 16400 pounds of suspended solids.

The grit removed at the Brampton plant averaged 8.15 cu. ft. per million gallons of sewage treated. Although the rate of grit removal was lower than the 1964 rate, the grit load at the plant is the highest of all OWRC operated plants.


AERATION TANK PERFORMANCE
LBS. B.O.D. X 100
CU. FT. AIR
LBS. B.O.D. PER 100 LBS. M.L.S.S. X 100
CU. FT. AIR PER LB. B.O.D. REMOVED
1962
1963
1964
1965
19


AERATION TANK LOADING
LBS. B.O.D. TO AERATION (AVERAGE)
M.L.S.S. (P.P.M.)
4063
5032
4844
4224
B.O.D.
M.L.S.S.
1962
1963
1964
1965
19

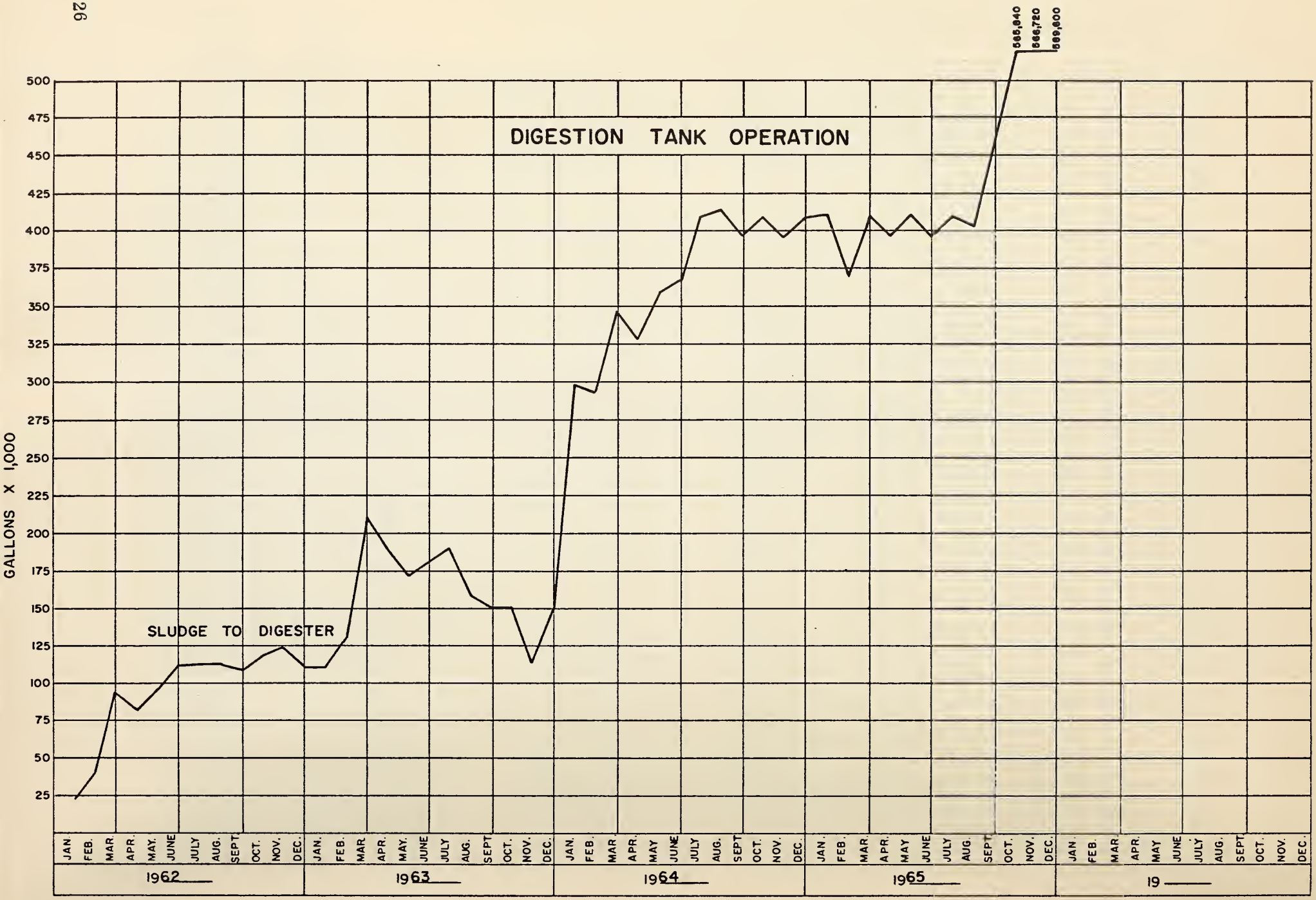
MONTH	PRIM. EFFL B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	-	867	-	-
FEBRUARY	195	811	101	668
MARCH	-	887	-	-
APRIL	-	833	-	-
MAY	96	1166	30	1432
JUNE	140	981	53	1062
JULY	170	931	73	1485
AUGUST	140	1020	57	-
SEPTEMBER	145	721	86	1072
OCTOBER	205	705	111	700
NOVEMBER	108	771	52	1895
DECEMBER	140	910	62	926
TOTAL	-	-	-	-
AVERAGE	149	884	69	1155

COMMENTS

The normal figures for the above table would be:

Prim. Eff. BOD	MLSS	lb. BOD per 100 lb. MLSS	Cu. Ft. Air per lb. BOD removed
150	2000-2500	30 - 50	1200

Since available air is the non variable the MLSS must be adjusted down to give the necessary air ratio of 1200 cu. ft. per pound BOD removed. This in turn gives an unusually high figure of 69 pounds BOD per 100 pounds SS.


DIGESTION TANK OPERATION
GALLONS X 1,000
500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
125
100
75
50
25
SLUDGE TO DIGESTER
586,840
586,720
589,600
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
1962
1963
1964
1965
19

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS (1000's Cu. Ft.)	SLUDGE FROM DIGESTERS
January	65.68	-
February	59.23	-
March	65.58	-
April	63.46	-
May	65.58	
June	63.46	4.62
July	65.58	17.49
August	71.37	28.43
September	74.04	7.29
October	90.68	-
November	90.82	-
December	94.49	-
Total	869.87	57.83
Average	72.49	14.46

COMMENTS

When weather conditions permitted the primary digester was maintained at a temperature of 115 °F. However, when the weather became cold, a temperature of 90° F was maintained.

The volume of sludge pumped to the digester was 869,870 cu. ft., an increase of 22% over 1964. Of this amount 260,000 cu. ft. were removed by liquid tank truck at a cost of 3.6¢ per cu. ft. (99¢ per cu. yd.)

The balance of 609,870 cu. ft. was disposed of on the site.

NOTE: It is not possible to supernate from the digester due to the shortage of available air in the aeration sections.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M)
JANUARY	73.677	3075	4.17
FEBRUARY	65.917	2633	3.99
MARCH	81.100	2692	3.32
APRIL	75.672	2536	3.35
MAY	62.019	2435	3.93
JUNE	67.209	2320	3.45
JULY	65.013	2670	4.11
AUGUST	69.856	3456	4.95
SEPTEMBER	72.773	4915	6.75
OCTOBER	68.936	4720	6.85
NOVEMBER	66.705	3180	4.77
DECEMBER	71.305	3286	4.61
TOTAL	840.142	37918	-
AVERAGE	70.012	3160	4.51 *

* chlorine for November and December prorated on 315 days data

COMMENTS

Year round chlorination is conducted at this plant. A total of 37,918 pounds of chlorine was used during 1965.

A large plant of the plant effluent, prior to chlorination, was diverted to the tertiary treatment pilot lagoons. Otherwise much more chlorine would have been used.

Assuming 200,000 gallons per day were diverted, the actual dosage of the effluent going directly to the receiving stream was approximately 5.0 ppm.

It was found necessary to purchase in advance the large chlorinator which will be used when the plant is enlarged to 5 mgd capacity. During peak flows it is necessary to chlorinate at a rate in excess of 250 pounds per 24 hours.

CONCLUSIONS

During 1965 the plant facilities were overloaded hydraulically 80% of the time, while the average 5-day BOD of the raw sewage was 390 ppm.

Work commenced on the 3 mgd extension in September 1965. This severely restricted site disposal of liquid digested sludge, and it is not anticipated that this type of disposal will be possible in the future.

Despite the adverse conditions of overloading and construction, the staff carried out their duties in a commendable manner.

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1965
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81775
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